

REMARKS

In the Office Action, the Examiner rejected claims 1-25. By this paper, Applicants cancelled claims 3, 10, 14, 19, 20, and 23, added new claims 26 and 27, and amended claims 1, 5-7, 13, 18, 21, 24, and 25 for clarification of certain features to expedite allowance of the present application. These amendments do not add any new matter. Upon entry of these amendments, claims 1, 2, 4-9, 11-13, 15-18, 20-22, and 24-27 will be pending in the present application and are believed to be in condition for allowance. In view of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration and allowance of all pending claims.

Claim Rejections under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 13, 18-21, and 23-25 under U.S.C. § 102(b) as anticipated by Edwards et al. (U.S. Patent No. 6, 275,381, hereinafter "Edwards"). Of these claims, claims 13, 18, and 21 are independent. Applicants respectfully traverse this rejection.

Legal Precedent

First, Applicants remind the Examiner that, during patent examination, the pending claims must be given an interpretation that is reasonable and consistent with the specification. *See In re Prater*, 415 F.2d 1393, 1404-05, 162 U.S.P.Q. 541, 550-51 (C.C.P.A. 1969); *see also In re Morris*, 127 F.3d 1048, 1054-55, 44 U.S.P.Q.2d 1023, 1027-28 (Fed. Cir. 1997); *see also* M.P.E.P. §§ 608.01(o) and 2111. Interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. *See In re Cortright*, 165 F.3d 1353, 1359, 49 U.S.P.Q.2d 1464, 1468 (Fed. Cir. 1999); *see also* M.P.E.P. § 2111. As further explained in Section 2111.01 of the M.P.E.P., the words of the claim must be given their plain meaning unless the applicant has provided a clear definition in the specification. *See In re Zletz*, 893 F.2d 319, 321, 13 U.S.P.Q.2d 1320, 1322 (Fed. Cir. 1989). Again, the plain meaning refers to an interpretation by those of ordinary skill in the art. *See In re Sneed*, 710 F.2d 1544, 218 U.S.P.Q. 385 (Fed. Cir. 1983).

Second, anticipation under section 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 U.S.P.Q. 773 (Fed. Cir. 1985). For a prior art reference to anticipate under section 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). To maintain a proper rejection under section 102, a single reference must teach each and every limitation of the rejected claim. *Atlas Powder v. E.I. du Pont*, 750 F.2d 1569 (Fed. Cir. 1984). Accordingly, the Applicants need only point to a single element not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter. The prior art reference also must show the *identical* invention “*in as complete detail as contained in the ... claim*” to support a *prima facie* case of anticipation. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989).

Features of Independent Claims 13, 18, 21 and 25 Missing from Edwards

Turning to the claims, the present independent claim 13, as amended, recites “first, second, and third *mounting fasteners* disposed in a triangular configuration and configured to *compress* the thermal interface material between the base and the plurality of components.” In contrast, the Edwards reference discloses that a lid (cap 50) is merely “pushed down onto the substrate, deforming the preform to fill the chip to cap gap.” See col. 9, lines 21-24. In other words, the preform merely flows or expands outwardly to fill the gap. The cited reference clearly does not disclose a fastener, much less three fasteners disposed in a triangular configuration for compressing the preform 12 between the cap 50 and chips 30. See col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Accordingly the cited reference cannot anticipate claim 13 or its dependent claims.

In addition, claim 13, as amended, recites “wherein the mounting surface comprises a plurality of surfaces disposed at different elevations that substantially conform to the differing contact-surface heights of the plurality of components.” Similarly, independent claim 18, as amended, recites “wherein the heat sink comprises an interface structure having surfaces disposed at different heights that at least substantially correspond with the differing contact-

surface heights of the multiple components.” Independent claim 21, as amended, recites “wherein the mounting interface comprises multi-elevational surfaces that at least substantially elevationally correspond with contact surfaces of the at least two components.” Likewise, independent claim 25, as amended, recites “means for spanning and at least substantially elevationally matching surfaces of a heat sink over a plurality of electronic components having contact surfaces of different elevations.” Quite the opposite, the Edwards reference discloses that the cap 50 has surfaces that do not match or have any correspondence with the surface heights of the two chips 30. *See* Fig. 5. Indeed, the cavity 54 is recessed from the taller chip 30 while a pedestal 56 interfaces with the shorter chip 30. *See* col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Therefore, the interface surfaces of the cap 50 are misaligned relative the surfaces of the chips 30. *See id.* Accordingly, the Edwards reference cannot anticipate claims 13, 18, 21, and 25, or their dependent claims.

Independent claim 18, as amended, recites “wherein the removable heat sink comprises at least one tool-free mounting mechanism.” Quite the opposite, the Edwards reference discloses that the lid or cap 50 is permanently attached to the substrate 36. *See* col. 7, lines 28-31; col. 9, lines 24-27. Further, the reference is absolutely devoid of a tool-free mounting mechanism. *See, e.g.,* col. 5, line 59 – col. 6, line 55; col. 7, lines 28-31; col. 9, lines 21-27; Fig. 5. For these reasons as well, the Edwards reference cannot anticipate claim 18 or its dependent claims.

Independent claim 21, as amended, recites “wherein the compliant material comprises a thermally conducting pad.” Applicants stress that the paste preform 12 of Edwards is not a pad, as claimed. *See* col. 5, lines 8-21; col. 6, lines 6-12 and lines 47-67; col. 7, lines 6-45 and 63-67. Indeed, the reference is absolutely devoid of a thermally conductive pad. Therefore, the cited reference cannot anticipate claim 21 or its dependent claims for this reason as well.

Independent claim 21, as amended, also recites “wherein the compliant material comprises a thermally conducting pad having at least one surface with an adhesive disposed thereon.” In sharp contrast, an adhesive is not disposed on the Edwards paste preform 12. *See* col. 5, lines 8-21; col. 6, lines 6-12 and lines 47-67; col. 7, lines 6-45 and 63-67. Indeed, the

Edwards system relies on the tackiness of the past preform 12 itself, on chemical compatibility of the preform 12 with the chips 30 and cap 50, and on any adhesive properties of the chips 30 or cap 50. *See* col. 1, lines 41-46; col. 5, lines 15-36; col. 7, lines 28-31 and lines 63-67. The reference is absolutely devoid of a thermally conductive pad having an adhesive disposed thereon. Accordingly, for this reason as well, the cited reference cannot anticipate claim 21 or its dependent claims.

Independent claim 25, as amended, recites “means for compressing the means for flexibly and thermally interfacing between the heat sink and the plurality of components.” Conversely, again, the Edwards reference discloses that the lid (cap 50) is simply “pushed down onto the substrate, deforming the preform to fill the chip to cap gap.” *See* col. 9, lines 21-24. In other words, the preform merely flows or expands outwardly to fill the gap. No means are disclosed in Edwards for compressing the preform 12. *See, generally*, col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Accordingly the cited reference cannot anticipate claim 25 or its dependent claims for this reason as well.

For these reasons, the Applicants respectfully request that the Examiner withdraw the rejection under 35 U.S.C. § 102 of claims 13, 18, 21, and 23-25 and allow the claims.

Dependent Claims

Applicants respectfully assert that the dependent claims are also patentable over Edwards by virtue of the subject matter they separately recite. Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of the dependent claims under 35 U.S.C. § 102 for this reason as well.

Claim Rejections under 35 U.S.C. § 103(a)

The Examiner rejected claims 1-3, 5, and 7 under 35 U.S.C. § 103(a) as being unpatentable over Edwards et al. Of these claims, claims 1 and 7 are independent. Also under 35 U.S.C. § 103(a), the Examiner rejected claims 4, 6, 14, and 15 as being unpatentable over Edwards et al. in view of Webb (U.S. Patent No. 5,875,095); claims 8, 9, 11, 12, 16, and 22 as

being unpatentable over Edwards et al. in view of Farnsworth et al. (U.S. Patent No. 6,307,747); claim 10 as being unpatentable over Edwards et al in view of Farnsworth et al. and further in view of Birger (U.S. Patent No. 6,519,152); and claim 17 as being unpatentable over Edwards.

Legal Precedent

First, the burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). To establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). The Examiner must provide objective evidence, rather than subjective belief and unknown authority, of the requisite motivation or suggestion to combine or modify the cited references. *In re Lee*, 61 U.S.P.Q.2d 1430 (Fed. Cir. 2002). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

Second, it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. § 2145. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *See In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); see M.P.E.P. § 2143.01. Similarly, if a proposed modification renders the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. M.P.E.P. § 2143.01 (citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)).

Features of Independent Claims 1 and 7 Missing from Edwards et al.

Independent claim 1, as amended, recites “a compliant non-paste material flexibly engaging the component interface of the heat sink against the plurality of components.” Quite the opposite, Edwards teaches that the preform 12 is a paste. See col. 5, line 59 – col. 6, line 55; col. 7, lines 45-67; col. 9, lines 21-24; Fig. 5. Indeed, the phrase “thermal paste preform” is incorporated in the title of the Edwards reference. See col. 1, lines 1-4. After all, the Edwards system is constructed around the use of a thermal paste. See, generally, col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Accordingly, claim 1 and its dependent claims are believed to be patentable over the Edwards reference.

In addition, claim 1, as amended, recites “a fastener configured to compress the compliant material between the heat sink and the plurality of components.” In contrast, the Edwards reference teaches that a lid (cap 50) is merely “pushed down onto the substrate, deforming the preform to fill the chip to cap gap.” See col. 9, lines 21-24. While the cited reference teaches that the lid or cap 50 is clamped to the substrate 36, the reference clearly does not disclose a fastener configured to compress the preform 12 between the cap 50 and chips 30. See col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Accordingly, claim 1 and its dependent claims are believed to be patentable over the Edwards reference for this reason as well.

Further, claim 1, as amended, recites “wherein the heat sink comprises a component interface having varying heights at least substantially corresponding to heights of the plurality of components.” Similarly, independent claim 7, as amended, recites “wherein the heat sink comprises surfaces that at least substantially match with heights of contact surfaces of the plurality of components.” As discussed above, the interface surfaces of the cap 50 are misaligned relative the surfaces of the chips 30, clearly not matching or corresponding to the surface-heights of the chips 30. See col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Accordingly, claims 1 and 7, and their dependent claims are believed to be patentable over the Edwards reference.

Independent claim 7, as amended, recites “wherein the flexible thermal interface material comprises a thermally conductive pad having a surface with an adhesive disposed thereon.” In contrast, as discussed, the Edwards reference teaches the use of a paste preform 12 not having a surface with an adhesive. See col. 5, lines 8-21; col. 6, lines 6-12 and lines 47-67; col. 7, lines 6-45 and 63-67. Again, the Edwards system relies on the tackiness of the preform 12 itself and on any adhesive properties of the chips 30 and cap 50. See col. 5, lines 15-36; col. 7, lines 28-31 and lines 63-67. Further, while the Edwards reference teaches embedding of particles 52 into the internal surface 41 or 51 of the cap 40 or 50 to “enhance the thermal transfer path,” the reference plainly does not teach an adhesive surface disposed on the paste preform 12. See col. 7, lines 32-38; col. 8, lines 14-21. Accordingly, claim 7 and its dependent claims are believed to be patentable over the Edwards reference.

For these reasons, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103 of claims 1 and 7, and their dependent claims, and allowance of the claims.

Dependent Claims – Deficiencies of Edwards and the Cited Combinations

In rejecting the dependent claims under 35 U.S.C. § 103 as listed above, the Examiner relied on Edwards alone and also on several combinations involving Edwards, Webb, Farnsworth, and Birger. However, the hypothetical modifications in view of the secondary references do not obviate the deficiencies of the Edwards reference as discussed above with regard to the independent claims. Therefore, the cited references, taken alone or in hypothetical combination, cannot render obvious the dependent claims. For these reasons, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103 and allowance of the claims.

Improper Modification – Lack of Objective Evidence of Reasons to Modify

In addition, the Examiner has not shown the requisite motivation or suggestion to modify or combine the cited references to reach the present claims. As summarized above, the Examiner must provide objective evidence, rather than subjective belief and unknown authority, of the requisite motivation or suggestion to combine or modify the cited references. *In re Lee*, 61

U.S.P.Q.2d. 1430 (Fed. Cir. 2002). In the present rejection, the Examiner combined the Edwards and Webb references, for example, based on the *conclusory and subjective statement* that it would have been obvious “to use the fastening configuration as disclosed by Webb for the device disclosed by Edwards for attaching the heat sink to a substrate.” Office Action, pages 3-4. Accordingly, Applicants challenge the Examiner to produce *objective evidence* of the requisite motivation or suggestion to combine the cited references, or remove the foregoing corresponding rejection under 35 U.S.C. § 103.

Improper Combination – References Teach Away From One Another

In addition to the complete lack of objective evidence, the Applicants stress the cited references teach away from one another and, therefore, are not properly combinable. *See In re Grasselli*, 713 F.2d 731 at 743. In fact, the cited references teach contrastingly different intended purposes and principles of operation, which would change if the cited references were combined as suggested by the Examiner. As summarized above, a proposed modification or combination of references is entirely improper and insufficient to support a *prima facie* case of obviousness, where the proposed modification or combination would change the principle of operation of the cited reference or render the cited reference unsatisfactory for its intended purpose.

Edwards and Farnsworth Teach Away From One Another

For example, in combining the Edwards and Farnsworth references, the Examiner relied on Farnsworth (the secondary reference) to teach a “tool-free attachment of the heat sink to the device.” Office Action, page 4. The Examiner contended that this tool-free attachment disclosed in Farnsworth reads on the presently claimed tool-free mounting mechanism. *See id.* In proposing to modify Edwards, the Examiner stated that it would have been obvious “to use the tool-free attachment as disclosed by Farnsworth for the device disclosed by Edwards et al. for easy heat sink replacement.” Office Action, page 4 (emphasis added). However, the Edwards reference plainly teaches away from easy replacement of cap 50. *See* col. 7, lines 28-31 (explaining that “the lid is clamped to, and permanently attached to the substrate”); col. 9, lines 24-27 (describing that “the lid is permanently attached to the substrate”). It is clear that the

Edwards principal of operation relates to a permanent attachment of the cap 50 or lid to the substrate 36. An intended result is for the cap 50 to function as a structural component and enclosure of the multi-chip module 75. *See* col. 5, line 59 – col. 6, line 55; col. 7, lines 38-50; col. 9, lines 21-24; Fig. 5. Therefore, the modification proposed by the Examiner would change the principle of operation of the Edwards system and render the Edwards system unsatisfactory for its intended purpose. Accordingly, the Examiner's proposed combination of the Edwards reference and the Farnsworth reference is improper and cannot stand. For these reasons, Applicants respectfully request withdrawal of the foregoing combination and the corresponding rejections under 35 U.S.C. § 103.

Edwards and Birger Teach Away From One Another

In another example, the Examiner improperly combined the Edwards and Birger references in rejecting dependent claim 10. Initially, Applicants note that while claim 10 has been canceled, the subject matter of claim 10 has been incorporated into independent claim 7. As for the cited combination, the Examiner acknowledged, correctly, that Edwards does not disclose an "interface material comprising a pad having an adhesive surface." Office Action, page 4. However, the Examiner then relied, incorrectly, on the Birger reference to disclose this feature missing from Edwards. *See id.* The Examiner stated that it would have been obvious "to use the pad as disclosed by Birger in the device disclosed by Edwards for the sufficient thermal conduction and easy assembly of all structural elements." *Id.* To the contrary, Applicants emphasize that the principal of operation of the Edwards system requires use of the deformable paste (i.e., preform 12) as disclosed. *See* col. 5, line 59 – col. 6, line 55; col. 9, lines 21-24; Fig. 5. Indeed, a requirement and intended purpose is that the thermal material be a paste and not a pad so that "it has a temporary increase in stiffness and decrease in tackiness between about 20 °C and about minus 100 °C." *See* col. 5, lines 15- 20; col. 8, lines 45-50; *see also* col. 7, lines 15- 20 ("The preform is subcooled to stiffen it and decrease tackiness."). The reference asserts that this non-pad paste material requirement is put in place to make possible the adequate paste-covering during manufacture of the multi chip modules and to insure their subsequent reliability during shipment and their thermal performance in operation. *See* col. 5, line 59 – col. 6, line 55; col. 7, lines 38-50; col. 9, lines 21-24; Fig. 5. With regard to the manufacture and performance

of the Edwards modules, for example, the paste material is required (instead of a pad) so that when the cap 40 or 50 is placed onto the substrate 36, the paste material deforms to “completely cover chip 30, and fill the thermal path to the cap 40 or 50.” See col. 8, lines 35-40; Fig. 5. Clearly, the Edwards reference teaches away from the use of a pad. Plainly, the modification proposed by the Examiner would change the principle of operation of the Edwards system and render the Edwards system unsatisfactory for its intended purpose. Accordingly, the Examiner’s proposed combination of the Edwards reference and the Farnsworth reference is improper and cannot stand. For these reasons, the Applicants respectfully request withdrawal of the foregoing combination and the corresponding rejections under 35 U.S.C. § 103.

Request Evidence to Support Official Notice

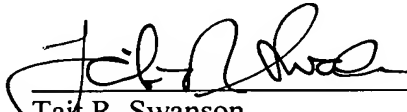
In the Office Action, the Examiner contended that both the thickness and the thermal resistance of the thermal interface material are merely a “matter of obvious design choice.” See Office Action, pages 2-3 and 5. Essentially, the Examiner has taken Official Notice of facts outside of the record that the Examiner apparently believes are capable of demonstration as being “well-known” in the art. The Examiner has ignored the large variation in types and properties of thermal materials, in the thermal output and geometry of the electronic devices to be cooled, and with the potential interfaces of components and heat sinks, and so on. Clearly, the desired or thickness and thermal resistance of thermal interface materials are not of a “notorious character” or “capable of such instant and unquestionable demonstration as to defy dispute.” M.P.E.P. § 2144.03. Therefore, in accordance with M.P.E.P. § 2144.03, the Applicants hereby seasonably traverse and challenge the Examiner’s use of Official Notice. Specifically, Applicants respectfully request that the Examiner produce evidence in support of the Examiner’s position as soon as practicable during prosecution and that the Examiner add a reference to the rejection in the next Official Action. If the Examiner finds such a reference and applies it in combination with the presently cited references, the Applicants further request that the Examiner specifically identify the portion of the newly cited reference that discloses the allegedly “well known” elements of the instant claim, as discussed above, or withdraw the rejection.

Conclusion

The Applicants respectfully submit that all pending claims should be in condition for allowance. However, if the Examiner believes certain amendments are necessary to clarify the present claims or if the Examiner wishes to resolve any other issues by way of a telephone conference, the Examiner is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

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